

# **WHEEL CREEK RESTORATION PROJECT**

## **BUSH RIVER PARTNERSHIP RESTORATION PROJECT #1**

**PROPOSAL for  
Local Implementation Grant  
Chesapeake and Atlantic Coastal Bays 2010 Trust Fund**

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## 1.0 General Description

**1.1 General Background** The Bush River Basin (MDE6DIGIT 02137) is centrally located within Harford County. Approximately 30% of the land within the County, or 113 square miles, drains to the Bush River Basin. An additional 12 square miles drains to the watershed from Aberdeen Proving Ground, a federally owned army installation currently expecting over 10,000 new jobs as part of the US Military Base Realignment and Closure. Aberdeen Proving Ground, or APG, borders Harford County to the south and separates the County from the shores of the Chesapeake Bay. Approximately 6 of the 9 miles of the Bush River are bordered by APG.

Over the past 30 years, the greatest amount of development within Harford County has occurred in the Bush River Basin. Approximately 50% of the current population in Harford County resides within the Bush River Basin. A significant majority of the County's priority funding area or development envelope, established in 1977, is located here, and will continue to increase the concentration of the population in this area.

Because of its location and amount of development, the Bush River Basin is the focus of Harford County restoration efforts. From 2001 to 2003 Harford County undertook a major initiative—the Bush River Watershed Restoration Action Strategy (WRAS)—to determine how best to assess and improve the overall health of the Bush River watershed. This effort culminated in the development and publication of the *Bush River Watershed Characterization* (September 2002) and the *Bush River Watershed Management Plan* (April 2003).

Since completing the WRAS, Harford County has been actively working on implementing recommendations from the management plan including design and construction of restoration projects and implementation of community outreach activities. One stream restoration and two stormwater retrofits have been constructed each having macroinvertebrate monitoring completed before and after construction. Seven additional restoration projects are currently under design with construction of three of the projects proposed for 2009. Pre-construction monitoring has been conducted for three of the restoration projects including a variety of chemical, physical and biological monitoring. A watershed assessment has been completed for Wheel Creek while two similar assessments within the Bush River Basin are under development.

Community outreach activities implemented from the watershed management plan include a watershed website [www.HarfordCountyMD.gov/WaterResources](http://www.HarfordCountyMD.gov/WaterResources) and an Adopt-a-pond program. The watershed website discusses the importance of water quality and educates the citizens about on-going restoration activities. The Adopt-a-pond program offers small landscaping grants to homeowners' associations to beautify and enhance water quality and habitat for a community's stormwater management facility.

In 2003, Builders for the Bay completed a year-long consensus process, to review existing development codes and identify regulatory barriers to environmentally-sensitive residential and commercial development at the site level. Members of the review committee included a diverse cross-section of local government, civic, non-profit, environmental, homebuilding, development and other community professionals. Recommendations were detailed in *Recommended Model*

*Development Principles for Harford County, MD: A Consensus of the Local Site Planning Roundtable* (CWP, 2003b). The proposed zoning code updates including a variety of recommendations from the roundtable were forwarded to the County Council in August 2008.

In November 2007, a group of partners interested in the health of the Bush River convened at the Otter Point Creek CBNERR-MD site where the Bush River Partnership was established. The purpose of the Bush River Partnership is to assist Harford County Department of Public Works (DPW) in implementing the various recommendations proposed in the WRAS process through continued partner efforts. Partners include county, state, and federal agencies, non-profits, and private industry, who wished to understand, protect, restore and monitor the Bush River. Harford County worked with this partnership to develop this proposal.

**1.2 Proposal Background** Harford County DPW recently completed the *Wheel Creek Watershed Assessment* (August 2008) with the intent to develop recommendations to control runoff from developed areas, correct stream channel instability problems, reduce sediment loadings and improve the overall water quality of Wheel Creek and its receiving waters, Winters Run, Otter Point Creek, and Bush River. Prior to completing this assessment, restoration activities while prioritized on a larger scale (30,000+ acres), were not focused on maximizing restoration opportunities geographically. Therefore, it has been difficult to demonstrate measurable improvements in water quality on a watershed basis because the scale has been too large. Beyond helping the Wheel Creek watershed itself, Wheel Creek Restoration Project is intended to provide a template for small watershed plans for Harford County DPW to implement in other areas within the Bush River Basin.

Harford County DPW identified a stormwater retrofit within the Wheel Creek watershed as a priority based on the findings of the *Bush River Watershed Management Plan*. The plan evaluated existing stormwater management facilities within the Winters Run watershed and prioritized recommendations for implementing retrofits. During the planning process for the stormwater retrofit, significant downstream channel instability was identified and it was decided that an assessment of the entire watershed should be conducted.

The Wheel Creek watershed (unofficially named) is centrally located in Harford County, approximately 3 miles south of the Town of Bel Air. It is a second order tributary to Winters Run (MDEDIGIT 02130702) and Atkisson Reservoir (MDE8DIGIT 02130703) in the Bush River watershed (MDE6DIGIT 021307) (Figure 1). Wheel Creek is situated along the eastern edge of the Piedmont physiographic province, drains 435 acres, and contains approximately 27% impervious cover. A mixture of commercial and high density residential land use dominate the headwaters of the watershed. The remainder of the watershed is dominated by medium and low density residential land use. The Harford Glen Environmental Education Center, which is part of the Harford County Public School system, is predominately forest and is located in the lower reaches of the Wheel Creek watershed.

Historic aerial photographs show the Wheel Creek watershed as rural through the early 1980s. However, by the late 1980s and early 1990s the upper watershed was nearly completely developed. Development spread into the middle watershed shortly thereafter. New residential

subdivisions are currently under construction while approximately 10% of the watershed is still available for future development.

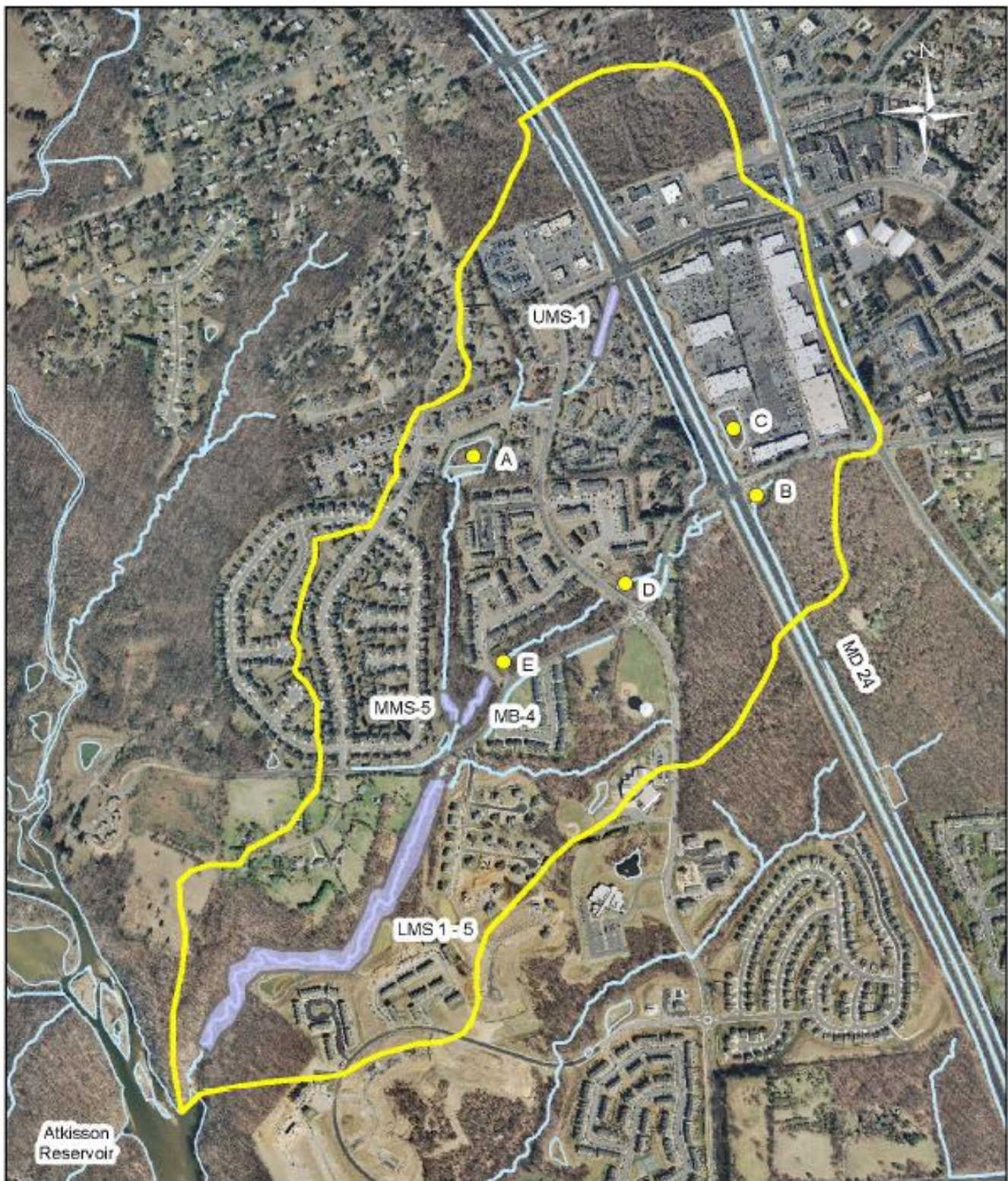
Changes in the hydrologic and sediment regimes associated with historic clearing of forests for agriculture and subsequent commercial and residential development have caused Wheel Creek and its tributaries to undergo significant morphological changes throughout the watershed. Changes in hydrology as well as alternations to the stream and adjacent floodplain to accommodate development have contributed to unstable channel conditions. The unstable conditions include incision of the streambed, streambank erosion, widening of the channel, lateral migration, and aggradation throughout much of the watershed. These channel adjustments have contributed a significant amount of sediment to downstream reaches and to Atkisson Reservoir which had already lost over 80% of its storage capacity by 1980 (MDDNR 2002).

The purpose of the *Wheel Creek Watershed Assessment* was to identify channel instability and sedimentation problems, identify opportunities for implementing stormwater retrofits and channel restoration projects and prepare a report of preliminary findings with recommendations. Based on the findings of this study, restoration recommendations and design concepts were developed, as well as preliminary cost estimates for design and construction.

**1.3 Proposal Summary** Harford County DPW is requesting funding for the implementation of the following activities within the Wheel Creek watershed that will be completed in cooperation with the Bush River Partnership and various other partners outlined in the next section:

- Improve water quality and decrease stormwater discharges by implementing five stormwater retrofits.
- Improve water quality and stream habitat by implementing four stream restoration projects.
- Create a greater sense of stewardship within the community through an innovative rain garden/rain barrel program including rain garden and rain barrel give-a-ways, garden tours, and construction installation workshops.
- Educate the local community and elected officials about water quality and the progress in restoring the watershed through community meetings and an environmental summit.
- Educate businesses located within the watershed about minimizing impacts to water quality through good housekeeping practices through workshops and on-site visits.
- Demonstrate a measurable reduction in sediment and nutrients through monitoring.
- Demonstrate improved physical in-stream characteristics through monitoring.
- Demonstrate improved fish, benthic macroinvertebrates, and habitat through monitoring.





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### Wheel Creek Restoration Project

- Stormwater Retrofit
- Stream Restoration

Figure 1

Source: Aerial 2007

0 1,000 Feet



#### **1.4 Proposal Specific Projects**

**Stormwater Retrofits.** Stormwater retrofits were investigated in the *Wheel Creek Watershed Assessment* and were developed for existing facilities that would provide the greatest opportunity for improved water quality and increased water quantity. Criteria used for selection included percent impervious cover draining to the facility, location within the drainage area, and existing conditions downstream. New facilities were not investigated at this time because of the density of existing development and lack of available land and the expense of constructing a new facility. The following prioritized list of proposed stormwater retrofits (Figure 1) will treat 63% (74.4 acres) of the total impervious area in the watershed:

- A Gardens at Bel Air South SWM
- B State Highway Administration SWM at Route 24 and Wheel Road
- C Festival at Bel Air SWM
- D Country Walk SWM Pond 1A (North)
- E Country Walk SWM Pond 1B (South)

**Stream Restoration.** Stream restoration projects (Figure 1) will reestablish the stream's geomorphology by grading banks and eroded areas, reconstructing channel meanders, and installing natural grade control structures such as log and boulder step pools as well as reconstructing riparian floodplains by grading and revegetating with trees and shrubs. Wheel Creek's hydrologic regime will be improved through the combined reduction of stormwater peak discharge and restored stream stability. The following prioritized list of proposed stream restorations will address 56% (3775 linear feet) of the total unstable stream length:

- UMS-1 Upper Mainstem Wheel Creek (400 feet)
- LMS-1 thru 5 Middle Mainstem Wheel Creek (2825 feet)
- MMS-5 Lower Mainstem Wheel Creek (250 feet)
- MB-4 Middle Branch of Wheel Creek (300 feet)

**Rain Gardens/Rain Barrels Demonstration Projects and Workshops.** Recognizing the importance and necessity of involving the community in restoration, this proposal will initiate new and innovative approaches to engage citizens and businesses. This approach will be based on lessons learned by the Corsica River Conservancy (which found that a community is more likely to participate if they have personally seen or known someone who has had a rain garden installed).

Harford County DPW along with various partners will nominate 5-10 households, businesses, and/or public buildings for installation of rain gardens and rain barrels as demonstration sites. Sites will be selected based on existing gardens and maintenance, site visibility, site suitability, willingness to participate, and current engagement in Bush River or other conservation efforts. Appropriate sites will "win" a rain garden (value of \$3,000), which will be installed by a Harford County DPW contractor and will include informational signage for educational purposes.

One year after completion, a garden tour of the demonstration sites will take place. This time period will allow plants to become established and to give property owners experience in the

amount of maintenance required. The last stop on the garden tour will be Harford Glen Environmental Education Center where informational packages and free giveaways will be available. Participants from the first year will be able to nominate others or interested parties can nominate themselves to “win” a rain garden for the following year. Installation of an additional 5-10 rain gardens followed by garden tours are also proposed for the second and third years.

A rain garden/rain barrel workshop will be advertised at the garden tour and will take place at Harford Glen Environmental Education Center or Emmorton Elementary School. During the first half of the workshop, participants will observe the installation of a rain garden and rain barrel. During the second half of the workshop, participants will assemble their own rain barrel and will be given guidance for their installation. This workshop will be free and will be limited to 20-30 participants. The status of the Wheel Creek Restoration Project will be highlighted during the workshop. Workshops are also proposed for the second and third years.

The following partners will assist Harford County DPW with the implementation of this proposed activity: CBNERR, Harford County Parks and Recreation/Anita C. Leight Estuary Center, Otter Point Creek Alliance, Harford Glen Environmental Education Center, Harford County Environmental and Maryland Conservation Corp.

***Community and Elected Officials Outreach.*** Harford County DPW has been working with various community groups and individual property owners in coordination of other restoration projects and understands the value and necessity of establishing a relationship in order for these projects to be successful. The citizens live and/or work within the watershed and the success or failure of a project relies on their accepting ownership of the restoration projects and the acceptance that their activities impact the health of the watershed. Likewise, a majority of the areas where the restoration projects are proposed are located on private property or property owned by a homeowners’ association. Therefore, Harford County DPW will need an easement from property owners for the construction of the restoration projects.

As outreach to the community and to the elected officials, annual meetings will be conducted at a convenient location within the watershed at either Harford Glen Environmental Education Center or Emmorton Elementary School. The meetings will provide updates on the status of the restoration projects. Educational materials and advertisements for the rain garden/rain barrel projects, garden tours, and workshop will also be available.

Additionally, the United States Geological Survey (USGS) will participate in educating the community on the importance of USGS’s national stream gaging network, explain what it is, how it works, how the data is used and by whom and why it is important to understand the hydrologic process. This will be accomplished through public meetings and by creating a permanent exhibit to be displayed at the Harford Glen Environmental Education Center.

Around the time of construction of the last restoration project, an environmental summit or watershed festival will take place at a highly visible location within the watershed. The Festival at Bel Air has been a proposed location. Activities will those similar to the county’s Earth Day celebration focusing on the restoration projects and ways to improve water quality.

After the completion of the restoration projects, Harford County DPW will continue to provide updates to the citizens with on-going updates to the website and through post-card mailings.

The following partners will assist Harford County DPW with the implementation of this proposed activity: CBNERR, Harford County Parks and Recreation/Anita C. Leight Estuary Center, Otter Point Creek Alliance, Harford Glen Environmental Education Center, USGS, and Maryland Conservation Corps.

***Business Outreach.*** 20% of the land use in the Wheel Creek watershed is commercial consisting of over 100 businesses. 37% are general retail, 26% are offices, 21% are restaurants/grocery stores and 14% are service oriented. Additionally, there is one gas station and one automotive retail store. Because of the variety and density of commercial land uses in the watershed, Harford County DPW proposes to conduct two workshops and distribute brochures and posters to educate commercial landowners on the various pollution prevention practices that can be done to improve water quality conditions within the watershed. These practices include vehicle maintenance and repair activities, vehicle fueling and spill prevention, outdoor storage, loading and unloading at docks, dumpster management, building and parking lot repair and maintenance, and landscaping and grounds care. Harford County DPW currently conducts on-site business inspections as part of the municipal NPDES program and will implement similar individualized inspections in Wheel Creek along with the workshops. Harford County DPW proposes to contract with the Center for Watershed Protection for assistance in implementing this program.

***Water Quality Monitoring.*** Project development and success will be evaluated through a paired watershed approach with Wheel Creek as the treatment watershed along with an appropriate control watershed. Water quality monitoring will be conducted during baseflow and stormflow conditions, and the samples will be analyzed for total suspended solids, pH, conductivity, total nitrogen, nitrate, ammonium, total phosphorus, and phosphate. Total rainfall, in-stream depth and discharge will also be measured at permanent in-stream gages. The number of stations, station locations and frequency of sample collection within the treatment and control watersheds will be further defined as part of an overall monitoring plan for the project.

At this time, Harford County DPW anticipates utilizing USGS for the collection of monthly baseflow samples and discharge measurements, and the collection of stormflow samples will be conducted by DNR, CBNERR-MD. Sample analysis will be conducted by Horn Point Laboratory, University of Maryland, Center for Environmental Science (UMCES).

Quarterly synoptic surveys will be conducted at 8 locations throughout each watershed using community volunteers. A graduate student and/or research intern through CBNERR-MD will be responsible for coordinating training and monitoring implementation for the volunteers. Water quality samples will be analyzed by Horn Point Laboratory. An annual analysis of all of the water quality data will be completed by UMCES and CBNERR-MD.

***Physical Monitoring.*** Measurement of in-stream physical parameters is necessary for the development of successful stream restoration design and for the measurement of successful stream restoration construction and stormwater retrofit construction. For each proposed stream restoration, cross sections and stream profiles will be surveyed and a photographic inventory will



take place two times annually prior to construction. Survey of these parameters along with all restoration measures will continue for approximately three years after construction completion. For each proposed stormwater retrofit, the physical measurements and photographic inventory will be taken downstream of the retrofit two times annually prior to construction and three years after completion. Physical monitoring will be conducted by a consultant to Harford County DPW.

***Biological Monitoring.*** Long-term, project success will be evaluated by monitoring improved habitat, and healthier biological communities. The same paired watershed comparison approach used for water quality monitoring will be used to characterize the biological monitoring. The number of stations and frequency of sampling within Wheel Creek and the control watershed will be further defined as part of an overall monitoring plan for the project and will follow protocols established by the Maryland Department of Natural Resources' Maryland Biological Stream Survey Program (MBSS).

Benthic macroinvertebrate, fish and physical habitat will be monitored on an annual basis at approximately five sites in the treatment and control watersheds. Habitat and benthic samples will be collected and processed by a consultant to Harford County DPW and fish will be collected by MBSS at each of these five sites. An additional 5 -10 stations throughout each watershed will be monitored for benthic macroinvertebrates and habitat by community volunteers utilizing MBSS's Stream Waders protocols. A graduate student and/or research intern through CBNERR-MD will be responsible for coordinating training and monitoring implementation for the volunteers. Samples will be analyzed by DNR.